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Cavity after Abdominal Operations

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SOME RESULTS OF THE POSTURAL METHOD OF DRAINING THE PERITONEAL CAVITY AFTER ABDOMINAL OPERATIONS.¹

BY W. L. BURRAGE, M.D.

IN the *Bulletin of the Johns Hopkins Hospital* for April, 1897, appeared an article on the postural method of draining the peritoneal cavity after abdominal operations, by J. G. Clark, M.D.

As my paper is an attempt to throw some light on the value of this method of drainage by an analysis of cases treated according to Dr. Clark's directions, it may be as well to begin by abstracting his article. He says:

The general trend of recent medical literature relating to intraperitoneal drainage through the abdominal incision has been towards the limitation or reduction of the number of conditions demanding its employment, and a few European gynecologists have even gone so far as to discard drainage entirely, leaving the peritoneum to protect itself.

The benefits to be derived from any form of drainage when used for the purpose of removing infectious matter from the peritoneal cavity are infinitesimal compared with the untoward or disastrous results which may follow its use.

The greatest safety lies in closing the abdomen without drainage, except in cases of purulent peritonitis or in operations when there has been extensive suturing of the intestines, and in a few other rare conditions. . . .

Escape of pus during an operation, oozing of blood or

¹ Read before the Obstetrical and Gynecological Section of the Suffolk District Medical Society, October 27, 1897.

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serum, extensive raw areas in the pelvis, are usually supposed to indicate the necessity of some form of drain; on the contrary, these are the cases which should be left to the care of the peritoneum, as demonstrated by a comparative study in our series of 1,700 cases of abdominal section of a hundred cases each of similar pelvic inflammatory affections, drained and undrained. The undrained cases presented by far the best results.

Every surgeon recognizes the dangers of dead spaces in the abdominal cavity and endeavors to prevent their formation, but frequently this is impossible. Mikuliez first called attention to this subject in a forcible paper, and devised a special drain for the prevention of oozing and for the removal of fluids from dead spaces; but this method, like all others, is unsatisfactory because the principle upon which it is based is wrong.

The chief objections to drainage of dependent pockets in the pelvis or abdomen through an abdominal opening are, first, fluids are frequently not removed, but on the contrary, are pent up by the gauze drain; and second, instead of removing infection, the gauze or tube may be the means of introducing it from the outside into the degenerated fluids.

To overcome the dangers of dependent pockets and dead spaces in the pelvis, I would suggest the elevation of the patient's body after operation to a sufficient height to start the flow of collecting fluids from the pelvis towards the diaphragm, and thus promote the rapid elimination by the normal channels of exit from the peritoneal cavity of infectious matter and of vital fluids which may stagnate in these pockets and form a culture medium for pyogenic micro-organisms.

As regards the employment of salt solution, Dr. Clark says:

It is a well-known principle in physics that a substance will undergo combustion or solution much more rapidly in a finely divided state than when massed together. The same principle may be applied to the disposal of foreign matter in the peritoneal cavity.

The author then goes on to take up the function of the peritoneum under normal and pathological conditions, and, after reviewing the literature, arrives at the following conclusions :

(1) Under normal conditions the peritoneum can dispose of large numbers of pyogenic organisms without producing peritonitis.

(2) The less absorption from the peritoneal cavity the greater the danger of infection.

(3) Solid sterile particles, such as fecal matter, potato, etc., are partly absorbed, and the remainder are encapsulated without the production of peritonitis.

(4) Death may be produced by general septicemia, and not by peritonitis, where large quantities of organisms are taken up by the lymph streams.

(5) Irritant chemical substances destroy the tissues of the peritoneum and prepare a place for the lodgement of organisms which becomes the starting-point for peritonitis.

(6) Stagnation of fluids in dead spaces favor the production of peritonitis by furnishing a suitable culture medium for the growth of bacteria.

(7) The association of infectious bacteria with blood-clots in the peritoneal cavity is especially liable to produce peritonitis.

(8) Traumatic injury or strangulation of large areas of tissue are strong etiological factors in the production of peritonitis when associated with infectious matter.

Under the heading of "Mechanism of Absorption of Fluids and Solid Particles in the Peritoneal Cavity," Dr. Clark speaks of the recent investigations of Muscatello on the histology of the diaphragmatic peritoneum and the mechanism of absorption. Muscatello found that beneath the peritoneal endothelium of the diaphragm and between the connective-tissue fibres are open spaces four to sixteen millimetres in diameter, occurring in groups of fifty or sixty, which communicate with the lymph vessels. A careful search

for these spaces failed to reveal them in any other portion of the peritoneum.

Attention is called to the fact that it had been proved by experiments on animals that the peritoneum was capable of absorbing the most remarkable quantities of fluids in a short space of time (the equivalent of the animal's entire weight in twenty-four hours), and also that Muscatello had demonstrated the existence of an intraperitoneal current which carries fluids and small particles towards the diaphragm, regardless of the posture of the animal experimented on. The rate of transmission of these particles from the peritoneal cavity to their ultimate repository, the lymph glands, could, however, be increased or retarded by the influence of gravity. The leucocytes are largely the bearers of foreign particles from the peritoneal cavity.

As to the "Postural Method of Draining Dead Spaces in the Pelvis," Dr. Clark claims that by it, first, stagnating fluids are prevented from collecting in dead spaces in the pelvis; second, infectious organisms are quickly carried into normal areas of the body where they are destroyed before they can increase in numbers; and third, toxic substances elaborated by the organisms are diluted and prevented from expending their irritant effects on a wounded area. He describes the method as follows:

At the conclusion of an operation all fluids and *débris* should be removed as far as possible by sponges, after which the abdominal cavity should be thoroughly irrigated with normal salt solution until the fluid comes away clear.

When the irrigation fluid is all sponged out, 500 to 1,000 c. c. of salt solution should be poured into the peritoneal cavity, so that when the patient is elevated after she is returned to the ward the artificial current may be started at once towards the diaphragm, thus supplementing the normal current.

After the introduction of the salt solution the omentum

and intestines should be replaced in an orderly way and the abdomen closed.

As soon as the patient is returned to her room, the foot of the bed should be elevated about twenty degrees (eighteen inches), which gives sufficient inclination of the posterior pelvic wall to assist the flow towards the general peritoneal cavity. This posture should be maintained for twenty-four to thirty-six hours, after which the bed may be lowered.

Dr. Clark's paper finishes with the report of three cases operated upon at the Johns Hopkins Hospital in which the postural method of drainage was employed. They were a suppurating ovarian cyst in two cases and a double pyosalpinx in the other case, and all were bad cases with extensive adhesions. They all made good recoveries.

In a most exhaustive article, entitled "A Critical Review of Seventeen Hundred Cases of Abdominal Section from the Standpoint of Intraperitoneal Drainage," published in the numbers of the *American Journal of Obstetrics* for April and May, 1897, the same author makes a strong argument against drainage through the abdominal incision. At the risk of being tedious I am going to read you the opening paragraphs of his paper. He writes :

In the following paper I propose to prove, from a review of 1,700 abdominal-section cases from the opening of the gynecological department of the Johns Hopkins Hospital, in 1889, up to October 1, 1896, that not only is drainage valueless in the great majority of cases in which it has hitherto been used, and is still used by some surgeons and gynecologists, but that it is frequently productive of harm.

By clinical observation the conditions supposed to demand drainage have gradually been reduced from a formidable number to a comparatively small one, and I am certain that this number is still too large.

The employment of a drain, as frequently stated by Dr.

Kelly, is a confession of imperfect work on the part of the surgeon. That he is unable in some cases to make it better is true, but in many cases a more minute attention to the smaller details of a surgical operation, with a greater reliance upon the ability of the peritoneum and general system to eliminate infectious matter, will overcome many difficulties which are now incorrectly supposed to be obviated by drainage.

I made use of this method of drainage for the first time at St. Elizabeth's Hospital on May 1st. From May 1st to October 1st the method was used there in 27 cases by the different members of the gynecological staff, and at present it is the accepted method in all serious abdominal operations in the gynecological department at that institution.

For the last two years we had been using drainage through the abdominal incision with less and less frequency. Some of us had left salt solution in the abdominal cavity at the close of the operation and all of us, in cases of shock and the loss of much blood, had elevated the foot of the bed after the operation; but the practical abandonment of external drainage together with the use of saline solution and the elevated decubitus had not been given a thorough trial until this summer.

The 27 cases include all of the severe operations, all those where there was escape of pus into the peritoneal cavity or where there was excessive oozing; in fact, those cases in which drainage through the abdominal incision would formerly have been thought to be necessary. There are included among them, however, a few less severe ones, that were treated with the postural drainage before it was evident that this treatment was of no especial benefit in such cases.

A comparison of drained and undrained cases would seem to be hardly profitable because of the impossibility

of selecting two series of cases nearly enough similar, but there is no question in my mind but that the undrained cases do better.

All of the 27 patients in my list recovered, but in this respect there is no difference from the recent previous results at St. Elizabeth's Hospital, for only one case out of 167 abdominal operations in the last eighteen months had been fatal, and that one was a case of Cæsarean section operated upon *in extremis*.

In four cases in which cultures were taken from the pus of tubal abscesses streptococci were found in two and were absent in two. As far as could be determined, those in which the streptococci were found had as smooth a convalescence as those in which the streptococci were absent, notwithstanding the fact that in several the pus unavoidably escaped into the peritoneal cavity.

The evening temperature and pulse records for the four days succeeding the day of operation were tabulated in 26 cases, and an average computed of each evening's temperature and pulse. One case was omitted because the patient developed pneumonia. The following table shows the result:

AVERAGE EVENING TEMPERATURE AND PULSE FOR FOUR DAYS
FOLLOWING DAY OF OPERATION. TWENTY-SIX CASES.

	Temp.	Pulse.
First day	100.4°	100
Second day	100.1°	97
Third day	99.4°	92
Fourth day	99.2°	79

Only one temperature reached the 102° mark, and that one was 102.4° on the first night. It declined to 99.8° on the fourth night.

A large increase in the twenty-four-hour amount of urine has been observed after leaving salt solution in the peritoneal cavity. The appended figures show the

number of ounces on the four successive days in two cases in which the salt solution was used and in two cases in which it was not used. In the latter two the foot of the bed was not elevated, but the patients received the customary rectal injection of salt solution and coffee at the close of the operation.

TWENTY-FOUR-HOUR AMOUNT OF URINE, IN OUNCES.

	<i>Salt Sol. Used.</i>		<i>Salt Sol. not Used.</i>	
	Case 1.	Case 2.	Case 1.	Case 2.
First day	63	41	25	17
Second day	38	62	24	18
Third day	40	47	26	31
Fourth day	33	33	30	25

As a scanty secretion of urine following abdominal operations has long been a well-known phenomenon, and as this has been thought to indicate a deficient elimination of waste products, the effect of the salt solution on the amount of urinary secretion must be considered beneficial.

It was my custom in the first cases on which the postural method of drainage was used to keep the foot of the bed elevated for twenty-four hours only; but after noting that several of the patients complained of pain in the flanks and had a more rapid pulse as soon as the bed was lowered, I adopted thirty-six hours as the proper time for the elevation of the bed, and have since found this time generally satisfactory. I am inclined to believe that the discomfort referred to may be in part, at least, avoided by lowering the foot of the bed gradually, that is, after twenty-four hours let it down half-way, and then lower it entirely at the end of thirty-six hours.

The relief of thirst is quite noticeable after the use of salt solution.

With the foot of the bed raised eighteen inches there is a tendency for the patient to slide towards the head

of the bed, and some patients complain of the discomfort attending this sliding. In this position of the body there is some difficulty in swallowing, but this difficulty is overcome by the patient's swallowing slowly. On the other hand, vomiting is much easier in this position. The nurses say that there is less nausea when the bed is elevated; and this opinion coincides with my observation, although I have known of two or three patients with whom the nausea seemed to be exaggerated by the position, notably a patient of one of my colleagues, who was violently nauseated on the night of the day following the operation, and the nausea was entirely relieved by lowering the bed.

In one or two fat women with abdominal distention we have noted embarrassment of the respiration. Distention is much less frequent, and this is probably due, in large measure, to the absence of interference with the intestines by the gauze drain.

Very few patients are able to urinate voluntarily during the first twenty-four hours after an abdominal operation, whether the foot of the bed is elevated or not. With the bed elevated the catheter must be used, unless, as is often done at St. Elizabeth's, both for urination and for the expulsion of enemata, the bed is lowered temporarily.

Patients experience no flushing of the face or headache as a result of the lowered head. They have little or no backache, in marked contrast to the amount of pain suffered after most abdominal operations when the bed is flat. There is less abdominal pain where the postural method is used. This immunity from pain I have thought can be attributed to the freedom of the pelvis from stagnating fluids, for, in the past I have observed that the post-operation abdominal pain was less, the cleaner and freer from oozing the pelvis was left at the close of the operation.

Elevating the foot of the bed has long been considered one of the valuable means of combating surgical shock; the employment of salt solution freely in the rectum and under the breasts has added to our resources; and now if we put hot salt solution in the peritoneal cavity and elevate the bed, we are not only assisting the peritoneum to rid itself of harmful fluids and micro-organisms, but stimulating the vital centres, washing out the kidneys and giving the blood sufficient volume to make good any loss.

On the whole, I think that the results of the postural method of draining the peritoneal cavity following abdominal operations warrant us in saying that the employment of this procedure marks a distinct advance in abdominal surgery.

